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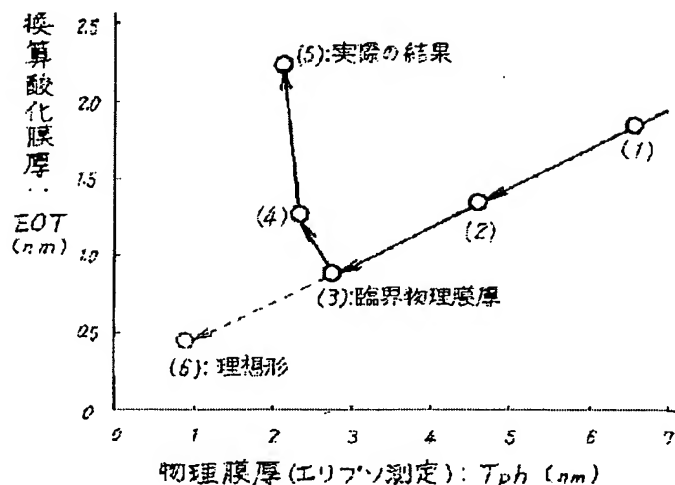
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TITLE : SEMICONDUCTOR DEVICE EQUIPPED WITH INSULATING FILM HAVING HIGH DIELECTRIC CONSTANT



**ABSTRACT :** PROBLEM TO BE SOLVED: To form a gate insulating film having a thin equivalent oxide-film thickness(EOT) and a smooth surface in a semiconductor device having a high dielectric insulating film (high-K).

**SOLUTION:** When diffusion preventing films exist in both the upper and lower interfaces of the high-K film, the physical film thickness of the high-K film must be adjusted to 2.4-5.0 nm. When a diffusion preventing film exists in either the upper or lower interface, the physical film thickness must be adjusted to 2.8-5.0 nm. When no diffusion preventing film exists in both the upper and lower interfaces, the physical film thickness must be adjusted to 3.2-5.0 nm. In addition, when a silicon nitride film exists as a diffusion preventing film in the interface between the high-K film and a silicon substrate, and a nitrogen-containing diffusion preventing film exists in the interface between the high-K film and an electrode, an ideal stable EOT and a low leakage current characteristic can be realized by adjusting the EOT to  $\geq 0.7$  nm.

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